

Appl. No. 10/090,128
Amdt dated November 25, 2003
Reply to Office Action of Oct. 7, 2003

REMARKS/ARGUMENTS

Specification

Several minor errors have been noticed and corrected in the specification as published under Pub. No. US 2003/0063834 A1. Thus, in paragraph [0077] reference to FIG. 2 has been corrected to FIG. 1. In paragraph [0098] reference to FIG. 4 has been corrected to FIG. 5. In paragraph [0100] the spelling of the word "within" has been corrected and reference to FIG. 7 has been corrected to FIG. 6. In paragraph [0102] reference to FIG. 3 has been corrected to FIG. 6. In paragraph [0110] reference to FIGS. 7 through 9 has been corrected to FIGS. 8 through 10. In paragraph [0114] reference to FIG. 8 has been corrected to FIG. 9. And in paragraph [0117] reference to FIG. 9 has been corrected to FIG. 10.

Drawings

The amended Figs. 1, 6, 7 and 10 previously omitted element or reference number 10 which has now been added. In addition, Fig. 6 previously omitted element 26 which has also been added..

Claim Rejections - 35 USC § 103

The Examiner has rejected claims 1-8, 11-15, 24-25 and 27 as being obvious under 35 U.S.C. 103(a) over Miller et al. U.S. Patent No. 5,295,205 in view of Pleibel et al. U.S. Patent No. 4,274,854.

In order to more clearly define the invention claimed in claim 1 over the cited references, this claim has been amended by indicating at the end thereof "so as to allow for the splitting of the optical signal into two orthogonal linearly polarized signals". This is clearly supported by the statement in paragraph [0051] lines 2-4 of the specification as published.

It is respectfully submitted that, as amended, claim 1 is not obvious over the combination of Miller et al. and Pleibel et al.

According to MPEP 2143, the basic requirement of a *prima facie* case of obviousness is that "...the prior art reference (or references when combined) must teach or suggest all the claim limitations". Furthermore, according to MPEP 2143.01, the prior art must suggest the desirability of the claimed invention.

Claim 1, particularly as amended, does not fall within the above requirements. Thus, as noted by the Examiner, Miller et al. essentially discloses and claims a standard Mach-Zehnder device comprising two coupling regions and a phase shifting region in between (col. 10, lines 12-24). Also, as noted by the Examiner, to achieve the phase shift which is the basic feature of the Mach-Zehnder principle of operation, Miller et al. discloses that the phase shifting region may consist of optical fibers which are dissimilar in their core diameter and/or their refractive index profile (col. 5, lines 37-49). This general principle is well known in the art and has also been disclosed in prior art such as U.S. Patent No. 5,119,453 and the article by B. Malo et al. which are referenced in the Miller et al. patent. The features that differentiate these prior art references is not the general description of the Mach-Zehnder structure, as has been made by the Examiner, but rather the properties of the coupling regions and of the shift region and the manner in which they are made to achieve desired properties.

Thus, referring now to claim 1 of the present application, the different levels of birefringence provided in the shifting region of the Mach-Zehnder interferometer of the present invention, which the Examiner has agreed is not disclosed in Miller et al., represent a very significant distinction from Miller et al. because they provide the Mach-Zehnder interferometer with a completely new and different optical property, i.e. polarization beam splitting, which has now been clearly defined in claim 1. This is totally distinct from the Miller et al. and other references disclosing the Mach-Zehnder structure which operate only as a power splitter.

It is also respectfully submitted that combining Pleibel et al. with Miller et al. to achieve the invention set out in claim 1 is improper, since neither of these references suggests such combination or particularly the desirability of such combination to achieve the result obtained by the present applicant, namely polarization beam splitting within a Mach-Zehnder interferometer.

Pleibel et al. does not even hint at a possibility of using its birefringent fiber in a Mach-Zehnder interferometer, let alone the specific adjustment of the levels of birefringence over the length of the intermediate branch of the interferometer so as to allow the splitting of the optical signal into two orthogonal linearly polarized signals. In fact, Pleibel et al. only refers to birefringence that “provides a polarization-preserving optical fiber”. Nowhere is it suggested that such fiber could be used as a polarization beam splitter within a device such as a Mach-Zehnder interferometer.

It is, therefore, clear that it would not be obvious to a person skilled in the art to combine Miller et al. with Pleibel et al. to arrive at the invention now claimed in claim 1.

Claims 2-8 all refer directly or indirectly to claim 1 and possess its patentable characteristics. It should be noted that in claims 1, 2, 3 and 4, the word “then” has been corrected to read “than”, and claim 7 has now been properly referred back to claim 1 and the words “are made” have been amended to read “consist” in order to overcome the Examiner’s objection that this claim refers to a “method of forming the device”.

Claim 11 has also been amended to make it clear that the birefringence in the phase shifting segment is adjusted “so as to allow for the splitting of the optical signal into two orthogonal linearly polarized signals.” This again clearly distinguishes this claim from the cited references taken alone or in combination, for the same reasons as discussed above in connection with claim 1.

Claims 12-15 refer back to claim 11 and thus possess its patentable characteristics. Again, in claims 11 and 15, the word “then” has been corrected to read “than” and in claim 13, the word “are” has been replaced by “consist of fibers” to obviate the Examiner’s objection that this claim refers to a “method of forming the device”.

In claim 23, the spelling of the word “syntonisation” has been corrected.

In claims 24 and 27, the word “then” has again been corrected to read “than”.

With regard to the rejection of claims 24-25 and 27 as being obvious over the Miller et al. and Pleibel et al., this rejection is again respectfully traversed. Both claims 24 and 27 indicate that the birefringence differential is calibrated so that it creates a polarization selective phase shift between the first optical signal and the second optical signal. There is absolutely no

indication either in Miller et al. or in Pleibel et al. or any reasonable combination of the two that such calibration would be possible, let alone desirable, to achieve the desired result of polarization selective phase shift. As already mentioned in relation to claim 1, Miller et al. provides a power splitter, not a polarization beam splitter and Pleibel et al. merely relates to stress induced birefringence in the fiber which provides a polarization-preserving optical fiber. There is no hint whatsoever in Pleibel et al. that by using such a fiber in a portion of a Mach-Zehnder interferometer and properly calibrating it, one could achieve a polarization selective phase shift instead of a power shift.

The allowance of claims 9-10 and 26 as well as of claims 16-23 has been noted.

Accordingly, in view of the foregoing amendments and remarks, it is respectfully submitted that the present application is now in condition for allowance and an early favorable action is earnestly solicited.

The Examiner is invited to call Applicant's agent if any questions remain following review of this response.

Respectfully submitted,



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